

## Digital mMirror Device Flight Spectrometer

Completed Technology Project (2016 - 2017)



## Project Introduction

The TI DLP spectrometer Bill of Materials (BOM) and schematics are available with the purchase of the TI DLP® NIRscan™ Evaluation Module (EM). We propose to acquire a NIRScan EM and review the BOM and schematics for application to flight; including considering for relevant environments and reliability. The result would be the development of a plan to take the instrument to a flight design using a NASA flight instrument development program (e.g., PICASSO). This proposed task would evaluate the acquired NIRspec EM with a sensor that is sensitive to longer wavelengths. The InGaAs detector in the COTS instrument will be replaced with a HgCdTe (MCT) sensor and the diffraction grating changed. Performance of the system will be evaluated through wavelength calibration and total throughput. All testing will be performed using existing hardware. The current optical system, which doesn't retain the entrance slit image at the DLP, will be redesigned such that the slit is imaged on the DLP and then this image collimated and focused onto the sensor. In this configuration the instrument becomes a very flexible hyperspectral instrument, with programmable selection of spectra from a specified portion of an imaged location or from a specific range of wavelengths or spectral resolution.

## Anticipated Benefits

A wealth of diagnostic information can be found in the near infrared (NIR) spectral region between 1 to 5 mm, including strong mineral, volatiles (ice) and organic absorption features. Past missions have flown spectrometers that operate in this region; however they are designed around 2D array detectors that require significant thermal control making these instruments large, power demanding with complicated thermal integration requirements, and expensive. Alternatively a single element sensor instrument would require much less power, have much simpler thermal control, and be much less expensive. Digital mMirror Devices (DMDs) are likely best known for use in Digital Light Processing (DLPs) and recently DMDs have found application in space-born astronomical instrumentations. DMDs, used as optical switches, provide a powerful solution allowing design of a new generation of instruments with unprecedented capabilities. We propose to evaluate an existing commercial DLP spectrometer for flight and to demonstrate its operation with a detector that can allow for observations between approximately 1 and 5 mm.



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

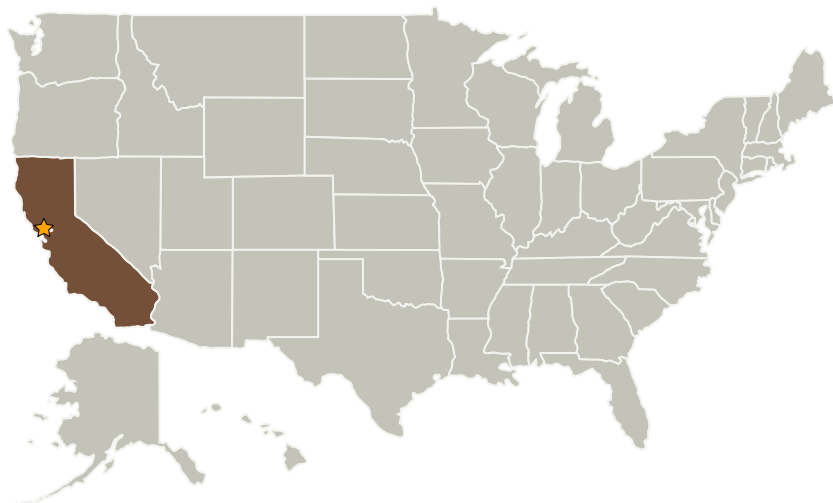
Center Innovation Fund: ARC CIF

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

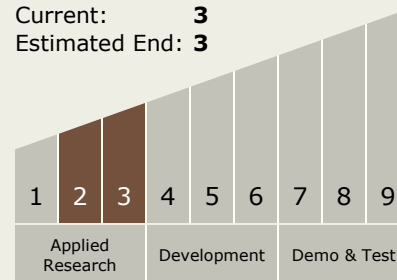
Harry Partridge

**Principal Investigator:**

Anthony Colaprete

## Technology Maturity (TRL)

Start: 2  
 Current: 3  
 Estimated End: 3



## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes

## Target Destinations

Mars, Others Inside the Solar System